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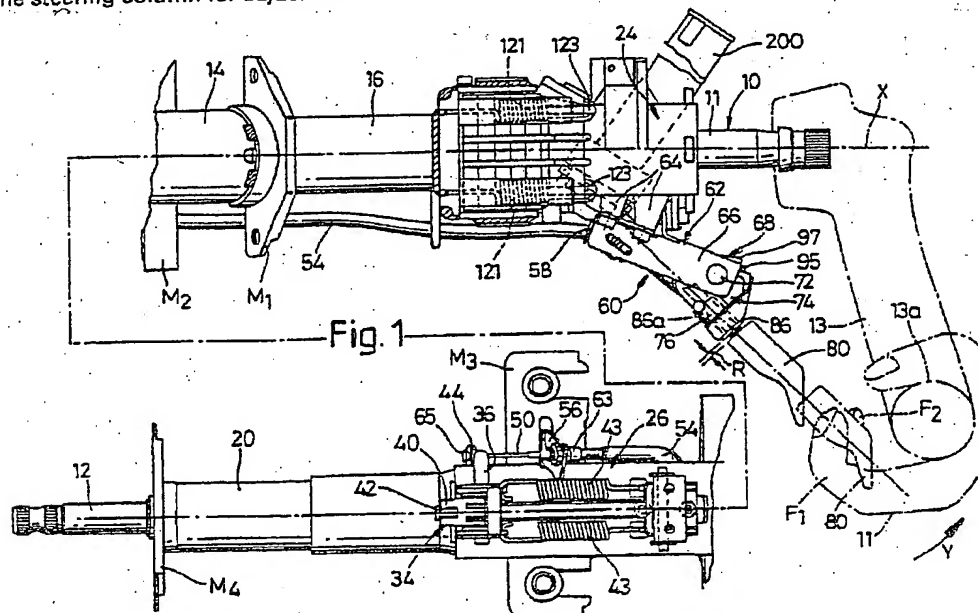
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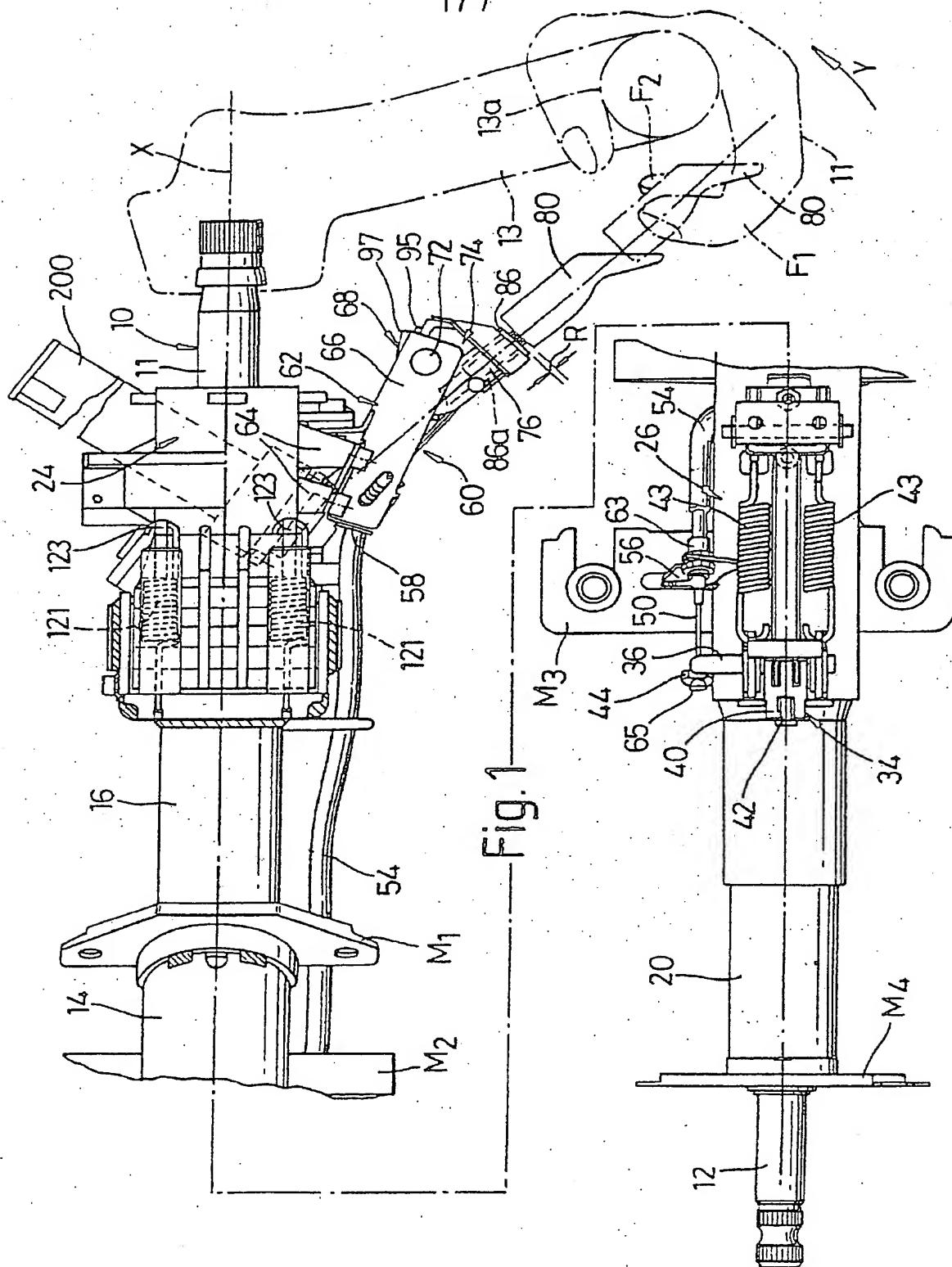
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## (54) Adjustable steering column

(57) The adjustable steering column has a control system 60 for releasing the steering column for adjustment and for locking the steering column after adjustment. The control system includes lever arrangement including a handle 80 which is movable away from a steering axis X of the steering column and from a pivot 72 for the lever arrangement to a position adjacent the rim 13a of a steering wheel 13 on the steering column to enable a user to grip the handle 80 and hold the rim of the steering wheel simultaneously with the same hand. While holding the rim 13a the user can use the same hand to move the handle 80 relative to the steering wheel 13 to release the steering column for adjustment.



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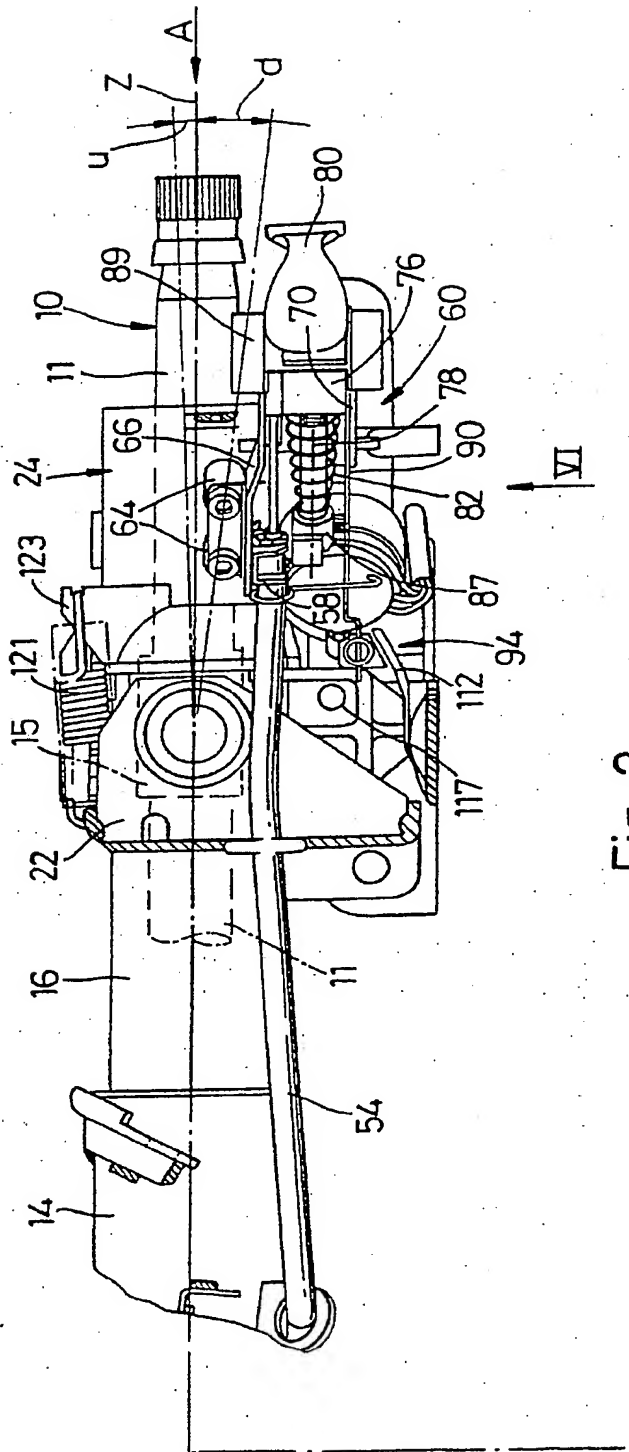
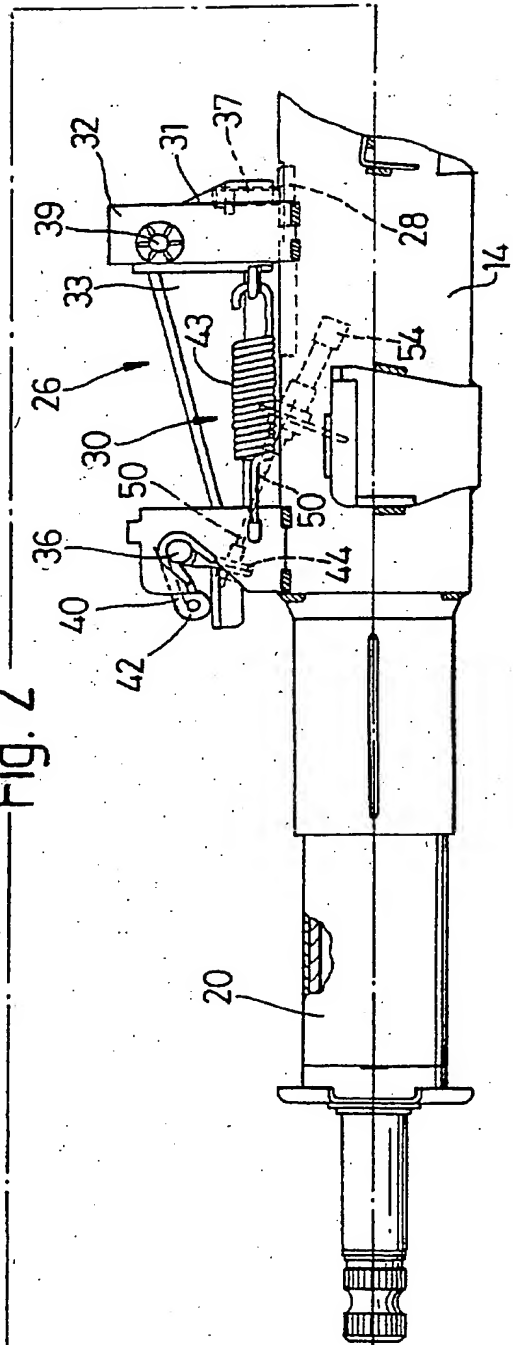


Fig. 2



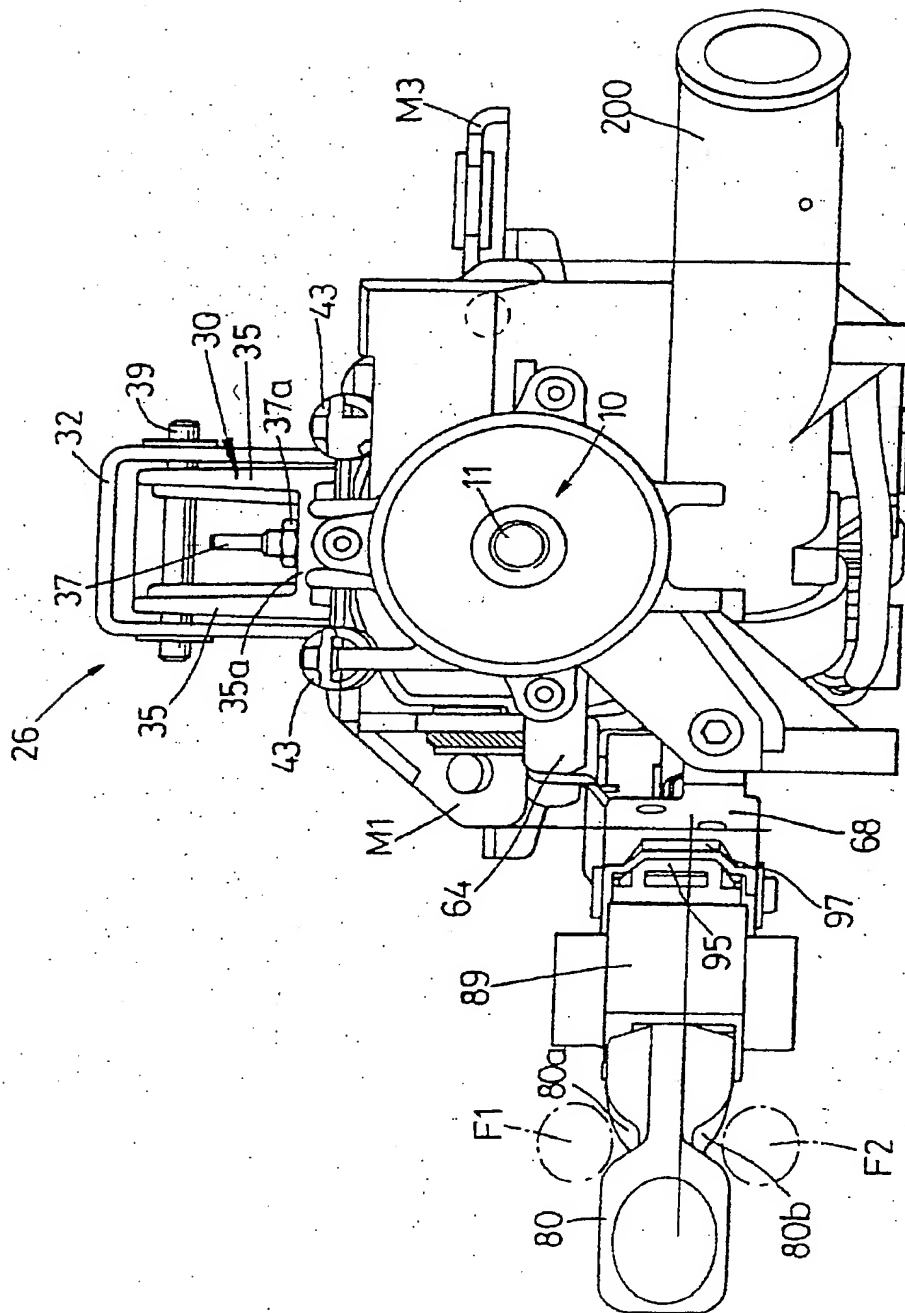


Fig. 3

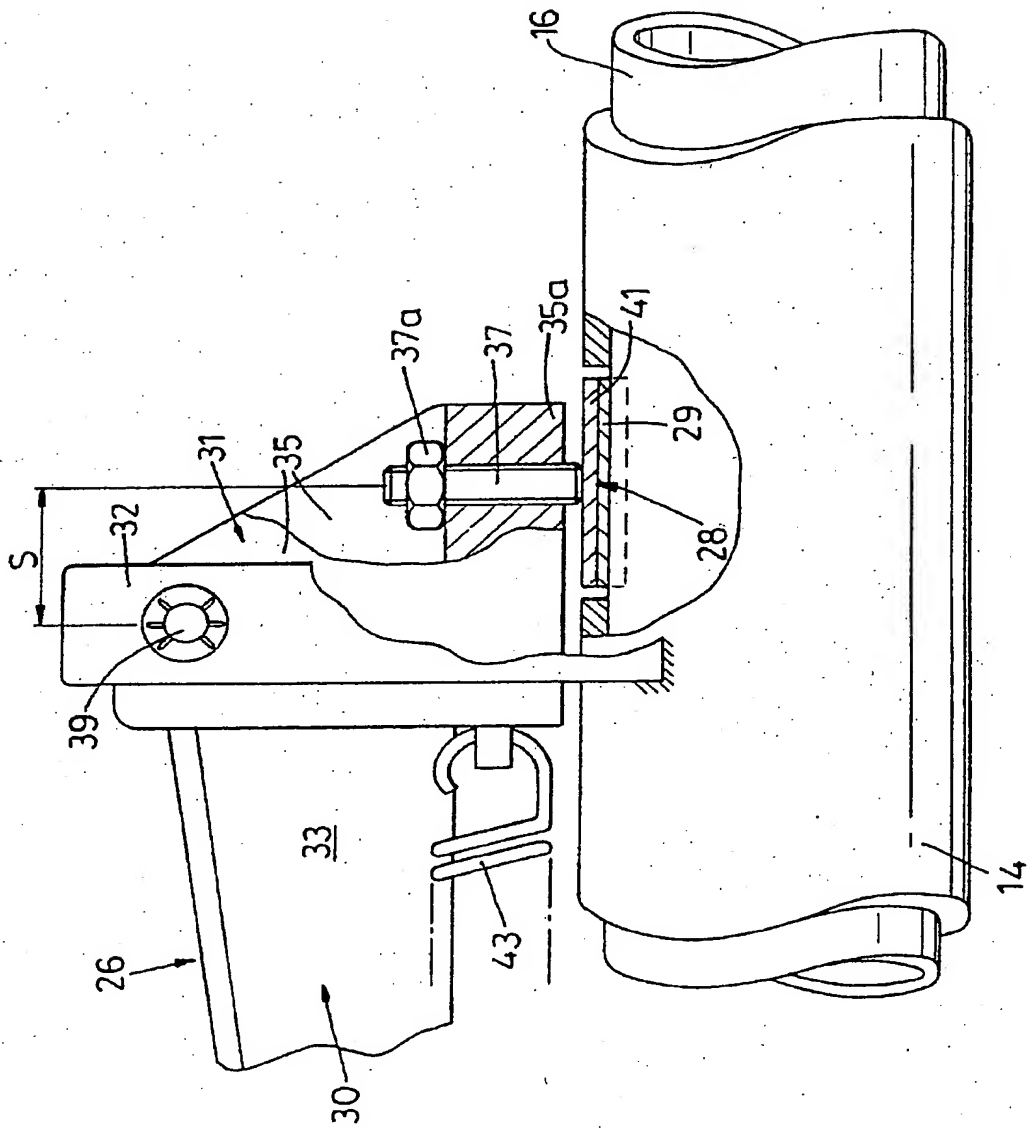
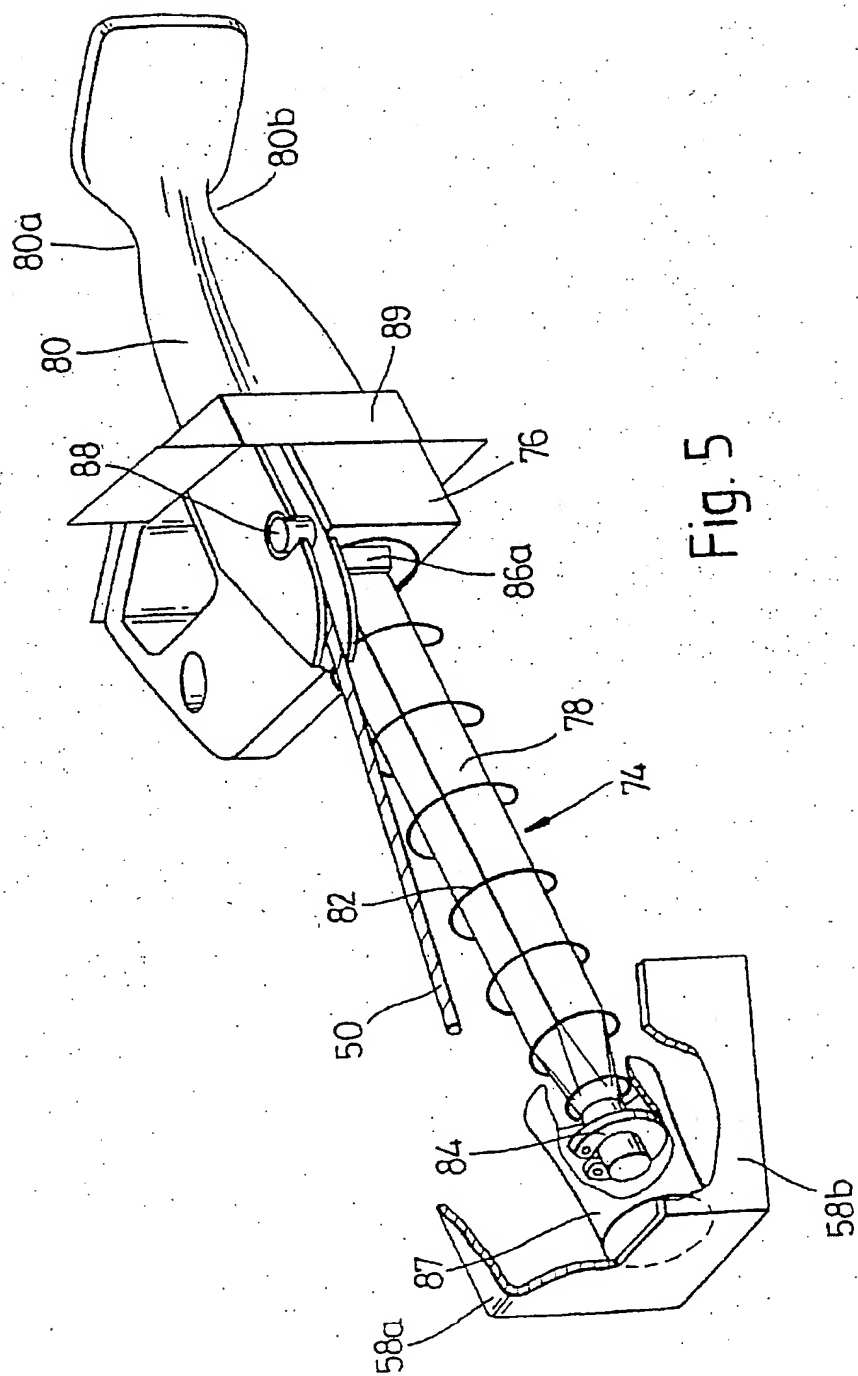
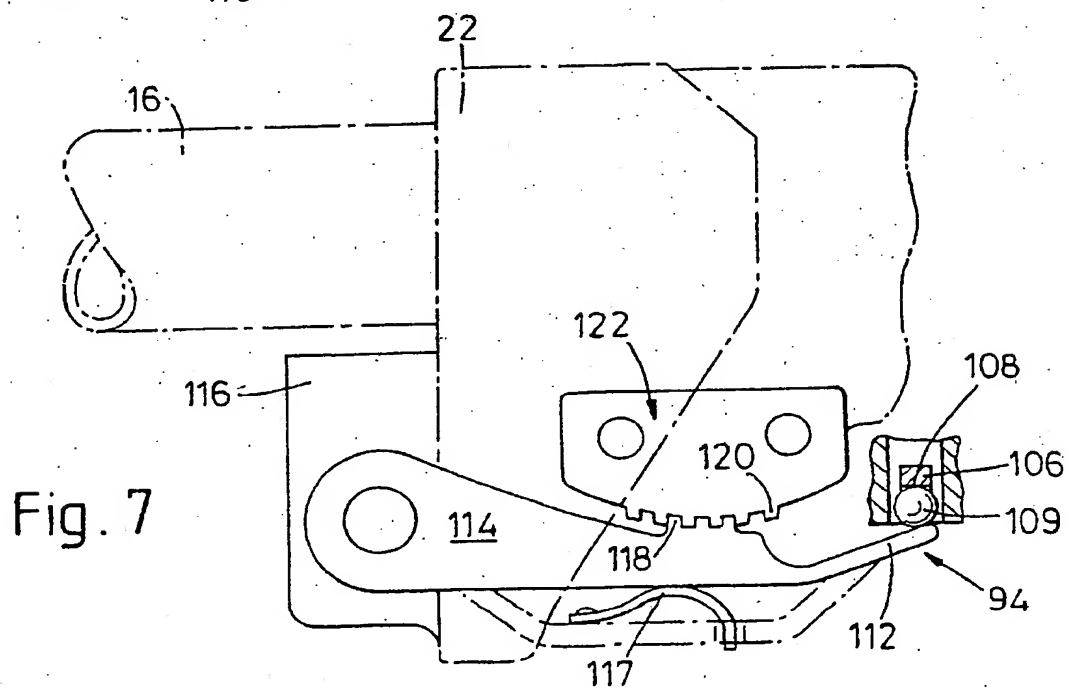
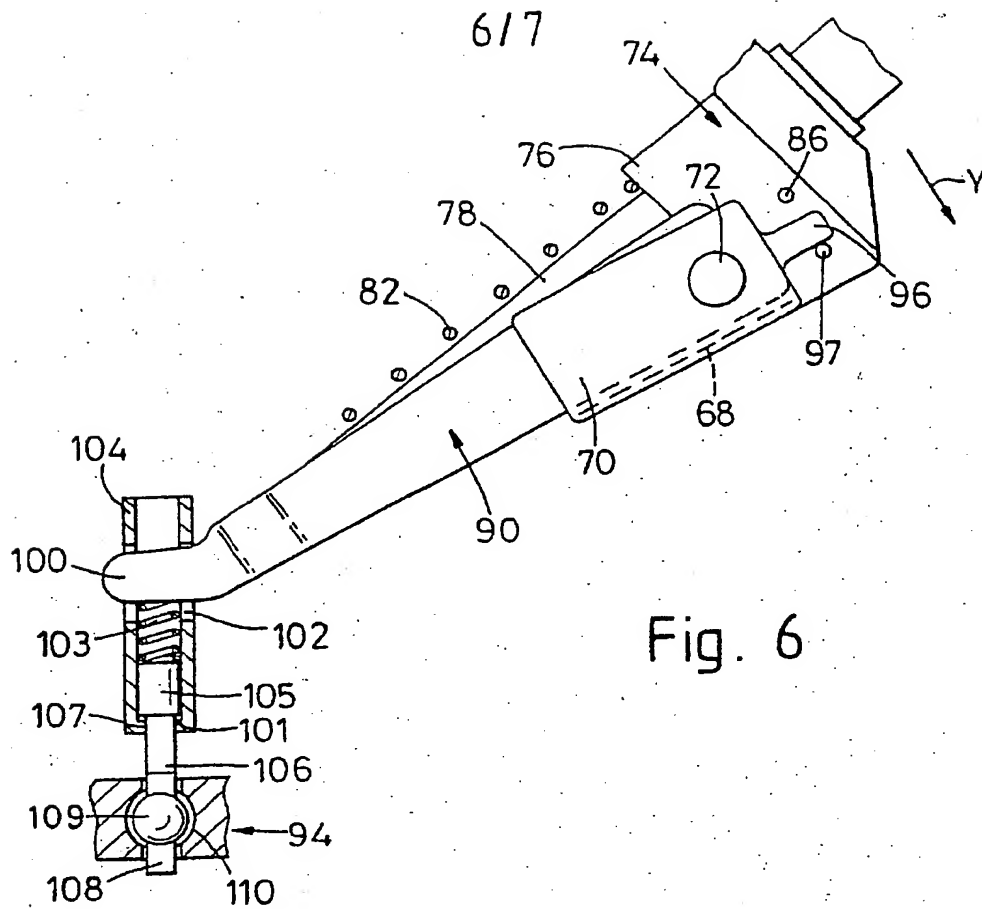


Fig. 4





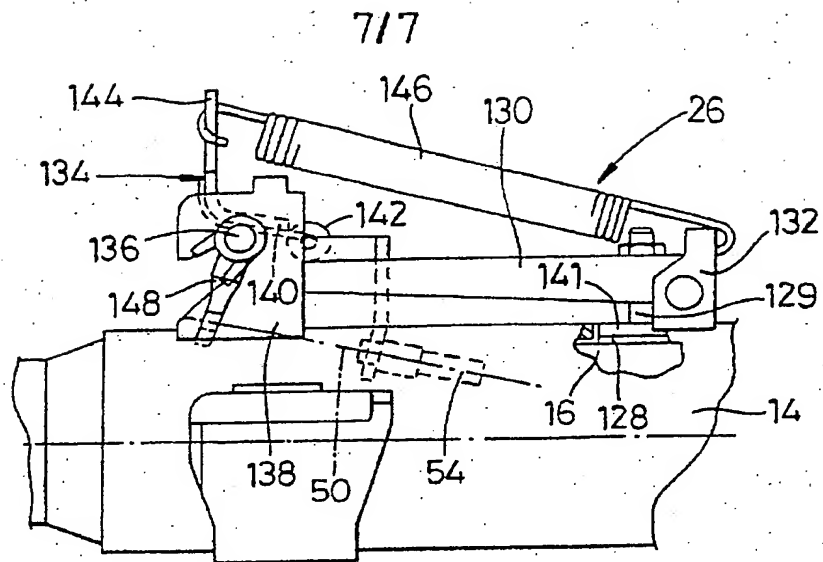


Fig. 8

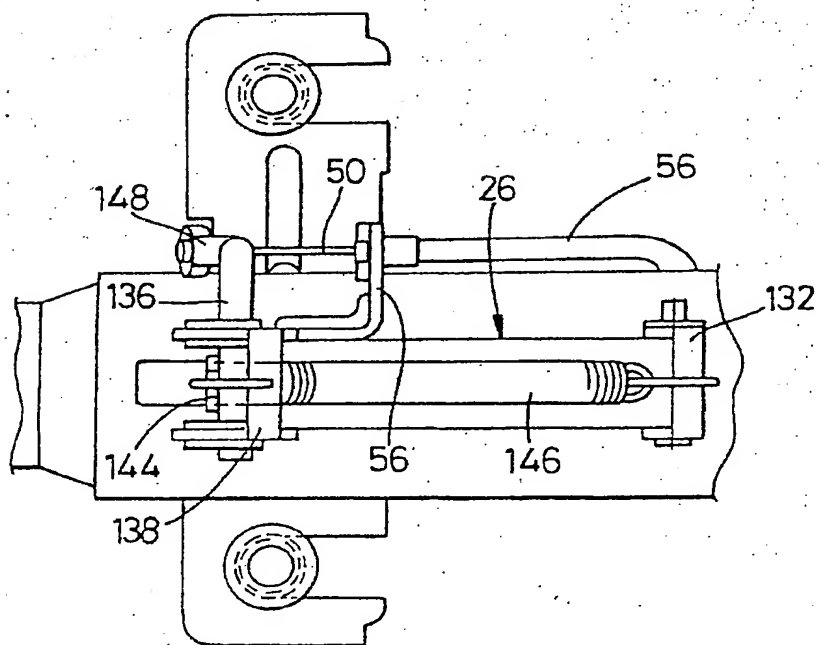


Fig. 9



AN ADJUSTABLE STEERING COLUMN FOR A VEHICLE

5 The invention relates to an adjustable steering column  
for a vehicle.

The use of an adjustable steering column in a vehicle in  
now becoming increasingly popular. Certain steering  
columns will provide adjustment of both length and  
10 steering wheel tilt whereas other steering columns  
provide only a single adjustment eg steering wheel tilt.

Normally, a steering column adjustment handle is provided  
for manipulation by the user with one hand, the other  
15 hand being used to hold the steering wheel and make the  
adjustment. Once the adjustment is completed, the handle  
is released and the steering column is locked in its new  
position. An example of such a handle is shown in US-A-4  
495 833. Such levers are normally spaced well away from  
20 the steering wheel so as to avoid accidental hand-contact  
therewith when the vehicle is being driven. However,  
such positioning of the lever can make it difficult to  
manipulate.

25 An object of the present invention is to provide an  
improved form of steering column which will help to  
reduce the foregoing problem.

According to the invention there is provided an adjustable steering column for a vehicle the steering column having a control means for releasing the steering column for adjustment and for locking the steering column after adjustment, the control means including a lever arrangement which includes a manually grippable member movable away from a steering axis of the steering column and from a pivot for the lever arrangement to a position adjacent a rim of a steering wheel on the steering column to enable a user to grip the member and hold the rim simultaneously with the same hand and then, while holding the rim, use that hand to pivot the member relative to the steering wheel to release the steering column for adjustment.

Such an arrangement is particularly advantageous as the manually grippable member, eg a shaped handle, can initially be positioned well spaced from the rim of the steering wheel to avoid accidental hand contact therewith. The arrangement also has the advantage that the hand used to grip the handle can react against the steering wheel making it easier to release the control means for adjustment of the steering column. Moreover, the hand used to grip the handle and the steering wheel simultaneously can also be used to effect the adjustment of the steering column once the steering column has been released for adjustment. By moving the manually

grippable member away from the pivot for the lever arrangement, leverage is effectively increased thereby providing a useful mechanical advantage. With such a mechanical advantage the handle may be pivoted by, eg,  
5 two fingers of the user. Preferably the manually grippable member is drawn towards the steering wheel rim to release the steering column for adjustment.

Preferably, the manually grippable member is movable away  
10 from the steering axis and lever pivot against a bias whereby upon manual release of the member, the member returns under the influence of the bias. The bias ensures that the manually grippable member will normally be spaced away from the rim of the steering wheel so that  
15 it will not be accidentally manipulated by the user when steering the vehicle.

Preferably a cushioning element is provided to cushion the return of the manually grippable member under the  
20 influence of the bias.

The control means may be arranged to actuate a release means for enabling part of the steering column to be adjusted angularly as a result of moving the said member  
25 relative to the steering wheel whereby the tilt or height of the steering wheel can be varied. Alternatively or additionally, the control means can actuate a release

means for enabling the steering column to be adjusted in length as a result of moving the said member relative to the steering wheel. Where both the length of the steering column and the angular positioning of part thereof are to be adjusted, movement of the manually grippable member relative to the steering wheel to release the steering column for adjustment may be arranged to permit both adjustments to take place simultaneously.

For column length adjustment, the steering column preferably has first and second telescopic parts the first of which is movable relative to the second to enable the steering column to be adjusted in length and the release means includes a brake which is normally urged into an operative position, ie in frictional contact with the one of the said first and second parts to inhibit telescopic movement, the release means being operable by the control means to release the brake to permit length adjustment of the steering column. Preferably, the brake is normally urged into its operative position by a brake lever of the release means which has a first arm arranged to move about a pivot so as to press the brake into its operative position and a second arm which is movable by operation of the control means to relieve the braking effect to permit length adjustment of the steering column. The brake lever may

be normally urged by a spring about its pivot so as to press the brake normally into its operative position.

5 The manually grippable member may form part of a lever arrangement pivotally mounted on the steering column whereby the member can be pivoted relative to the steering wheel by the user to release the steering column for adjustment. Ideally, the member is moved towards the steering wheel to release the steering column for  
10 adjustment.

In a preferred embodiment the brake applies braking to one of the first and second parts of the steering column such that attempted movement of said one member in a  
15 direction which reduces the length of the steering column causes the brake to provide a greater frictional resistance to such movement.

For angular adjustment of the column the control means  
20 may be arranged to actuate a release mechanism for enabling part of the steering column to be adjusted angularly as a result of moving the said manually grippable member relative to the steering wheel whereby the height or tilt of the steering wheel can be varied.

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A stop member may be provided which prevents pivoting of

the manually grippable member until the manually grippable member has been moved away from the lever pivot and steering axis.

5 The manually grippable member may form part of a first lever of the lever arrangement, the lever arrangement including a second lever which is operated, eg, by pivotal movement of the first lever to release the steering column for adjustment. The first lever may  
10 transmit pivotal movement to the second lever after the first lever has travelled through a given distance. In that way, the first lever can return to a starting position for locking the steering column without the first lever interfering with the locking action when it  
15 is not being used to release the steering column for adjustment. The second lever may be arranged to effect release of the steering column for angular movement. Conveniently, the first and second levers may be mounted on the pivot of the lever arrangement.

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The aforesaid first lever may be connected to transmission means such as a cable operable to release the steering column for length adjustment as a result of pivotal movement of the first lever.

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An adjustable steering column in accordance with the invention will now be described by way of example with

the reference to the accompanying drawings in which:-

Fig 1 is a plan view of a steering column in accordance with the invention,

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Fig 2 is an elevation of the steering column shown in Fig 1,

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Fig 3 is an end view of the steering column showing Figs 1 and 2 looking in the direction of arrow A in Fig 2,

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Fig 4 is an elevation to a larger scale of part of the steering column of Figs 1-3 showing part of a release device for releasing part of the steering column for length adjustment,

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Fig 5 is a perspective view of a first lever and handle of a lever arrangement forming part of the steering column in Figs 1-4,

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Fig 6 is a view of part of the steering column shown in Figs 1 to 3 looking in the direction of arrow VI in Fig 2 and showing a second lever of the lever arrangement,

Fig 7 is a diagrammatic elevation of a release mechanism for releasing part of the steering column for angular adjustment,

Fig 8 is an elevation of part of a steering column similar to that shown in Figs 1-3 but having an alternative form of release device for releasing part of the steering column for length adjustment and,

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Fig 9 is a plan view of the release device shown in Fig 8.

Referring to Figs 1 to 7, the steering column comprises a main steering shaft 10 comprising an upper shaft section 11 and a lower shaft section 12, the two shaft sections being splined together within the steering column to facilitate relative axial movement thereof on steering axis X when adjusting the length of the steering column.

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The steering shaft 10 is supported for rotation within a fixed tube 14 and a sliding tube 16, the latter being slidable telescopically within the fixed tube 14 in known manner. The fixed tube 14 is connected to a lower column mounting 18 through an axially deformable tube 20.

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The sliding tube 16 carries a yoke 22 at its upper end which pivotally supports an upper column section 24, typically a metal casting. The pivotal connection between the yoke 22 and the column section 24 takes the form of pivot pins 25 which pass through bearing bushes

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(not shown) in the yoke 22 and column section 24.

The upper shaft section 11 is splined, in use, to a steering wheel 13 shown in broken lines in Fig 1. The upper shaft section 11 includes a universal coupling 15 (see Fig 2) between parts thereof to permit up and down angular adjustment of the steering wheel 13.

Looking at the steering column in more detail, the fixed tube 14 and the sliding tube 16 include a spline (not shown) therebetween which prevents relative rotational movement occurring between the two tubes but which will permit telescopic adjustment thereof. The fixed tube 14 carries a release device 26 (constituting the aforesaid release means) including a brake shoe 28 frictionally engageable with the sliding tube 16, a brake lever 30 pivotally connected at one end to a bracket 32 on the fixed tube 14 and a brake applying member 34 having a shaft 36 pivoted on a bracket 38 mounted on the fixed tube 14. The brake shoe 28 is arcuate in transverse cross-section and comprises friction material 29 bonded to a metal plate 41. The brake applying member 34 comprises an arm 40 attached to the shaft 36 and carrying a roller 42 and further comprises a release arm 44 which is connected to a cable 50. The cable 50 is operated by a control system (constituting the aforesaid control means) described below and indicated generally at 60. The

brake lever 30 has a generally vertical first arm 31 and a generally horizontal second arm 33. The first arm 31 has spaced apart side sections 35 with a base section 35a extending therebetween. The base section 35a has an adjustable screw 37 therein which can be locked in its adjusted position by means of a locknut 37a. The lever 30 is mounted for pivoting on a shaft 39 carried by the bracket 32 and the lower end of the screw 37 as viewed in Figs 3 and 4 is biased normally against the plate 41 which carries the brake shoe 28. Two tension springs 43 extend between the arm 31 or lever 30 and the bracket 38. The springs 43 tend to pivot the lever clockwise as viewed in Fig 4 thereby urging the screw downwardly against the plate 41 and urging the brake shoe 28 into frictional engagement with the tube 16 to inhibit axial telescoping movement thereof relative to the tube 14. It will be noted from Fig 4 that the screw 37 is spaced from the shaft 39 by a distance S. Therefore, with the brake shoe 28 frictionally inhibiting axial movement of the tube 16, any attempt to push the tube 16 in a column shortening direction, ie towards the left as viewed in Figs 1, 2 and 4, the plate 40 will try to move the screw 37 to the left and pivot the lever 30 clockwise. Any such clockwise movement effectively presses the brake shoe 28 more firmly into contact with the tube 16 so as to increase the frictional resistance to tube movement. The lever 30 thereby produces a servo effect. To release the braking effect of the brake shoe 28, the other end of the lever 30 is acted upon by the roller 42. Movement of the cable.

50 to the right as viewed in Figs 1 and 2 causes the brake applying member 34 to be turned anti-clockwise against the bias of spring 46. That, in turn, causes the lever 30 to be moved anti-clockwise about the shaft 39 so as to relieve the braking effect of the brake shoe 28 and permit the tube 16 to be moved axially relative to the fixed tube 14. The cable 50 passes through a sheath 54 mounted at one end in a bracket 56 on the fixed tube 14 and at its other end in a bracket 56 adjustably mounted on a support 62 for the control system 60. The sheath 54 has a cable adjustment screw arrangement 63 of known kind thereon which co-operates with the bracket 56. The adjustment screw arrangement 63 is normally adjusted so that the cable 50 moves to the right by a short distance before a nipple 65 thereon acts against the release arm 44 to relieve the effect of the brake shoe 28. By arranging for the nipple 65 to be spaced slightly from the release arm 44 prior to movement of the cable 50, the brake lever 30 can pivot clockwise to provide the servo-effect described above.

The support 62 is mounted on two projections 64 on the column section 24 and comprises an upper plate 66, a downwardly extending plate 68 and a lower plate 70 carried by the lower end of the downwardly extending plate 68 and extending beneath the upper plate 66. A pivot pin 72 extends through the upper and lower plates

66, 70 and a first lever 74 is pivotally mounted on the pin 72 between the upper and lower plates 66, 70. The lever 74 is shown in detail in Fig 5 and comprises a tubular outer section 76 through which slidably passes a rectangular cross-section rod 78. The rod 78 has one end fast with a handle 80 (the aforesaid manually grippable member) which can be pulled from the full-line position shown in Fig 1 to a fully extended broken line position against the bias of a spring 82. The spring 82 extends between a retaining clip 84 at the opposite end of the rod 78 and an opposing face of the outer section 76 of lever 74. In the full-line retracted position of the handle 80, the end of the handle adjacent the lever 74 is spaced by a distance R from a plastics liner 86 having a square cross-section tube 86a thereon extending through the outer section 76 and which slidably supports the shaft 78. The spring 82 biases the handle normally into the full-line position shown in Fig 1. A resilient tubular buffer 87 is mounted on the left-hand end of the rod 78 as viewed in Fig 5 for abutment with a downwardly extending part 58a of the bracket 58. The buffer 87 acts to cushion return movement of the shaft under the influence of the spring 82. The bracket part 58a has a projection 58b which extends alongside the buffer 87 and prevents or limits pivotal movement of the lever 74 about the pin 72 when the lever 74 is in the position shown in Fig 5 and shown in full lines in Fig 1.

The lever outer section 76 is attached to a nipple 88 secured to the cable 50. Anti-clockwise pivotal movement of the lever 74 as viewed in Fig 1 will draw the cable 50 through the sheath 54 and rotate the brake applying lever 30 anti-clockwise to relieve the brake shoes 28 and permit axial adjustment of the sliding tube 16.

A plastics shroud 89 is mounted on the right-hand end of the lever outer section 76 which normally occludes an aperture in a plastics casing (not shown) around the adjacent section of the steering column and through which the handle 80 extends.

A second lever 90 (shown in detail in Fig 6) is pivoted adjacent one end on the pivot pin 72 and extends towards the column section 24 to operate a release device indicated generally at 94. The release device 94 enables the column section 24 to pivot about the pivot pins 25 thereby providing angular adjustment of the column section 24 and hence the steering wheel 13. Adjacent the pivot pin 72, the second lever 90 is formed with a finger 96 which extends between two downward projections 97, 98 on the hollow section 76 of the first lever 74. As the first lever 74 is pivoted about the pivot pin 72 in the direction of arrow Y in Figs 1 and 6, the projection 98 travels through free space before striking the finger 96. Subsequent pivotal movement of

the lever 74 in the direction of arrow Y then pivots the lever 90 about the pivot pin 72 to release the release device 94 and permit angular movement of the column section 24. Pivotal movement of the lever 74 in direction Y is limited by a projection 95 on the outer section 76 of lever 74 which moves against a stop surface 97 on the downwardly extending plate 68.

The lever 90 includes a tongue 100 which moves through slots 102 formed in a tube 104 mounted on the column section 24. The tube 104 slidably houses a cylindrical member 105 axially fast with a ramp defining member 106 which extends slidably through an aperture 107 at the right hand end of the tube 104 as viewed in Fig 4. A compression spring 103 extends between the tongue 100 and the adjacent end of the cylindrical member 105 and normally biases the member 105 towards a shoulder 101 at the right hand end of the tube 104. The ramp defined by the member 106, and which is indicated at 108, cooperates with a ball 109 arranged loosely within a bore 110 in a section of column part 24.

Pivotal movement of the second lever 90 in the direction Y causes the tongue 100 to strike the left hand ends of slots 102 and draws the ramp defining member 106 to the left so as to urge the ball 109 against an operating finger 112 of a locking lever 114. As shown in Fig 7,

the locking lever 114 is pivotally connected to a bracket 116 on the yoke 22. The locking lever 114 is normally biased upwardly by a leaf spring 117 on part of the column section 24. The locking lever 114 is formed with an arcuate row of teeth 118 which mesh with teeth 120 on a plate 122 rigidly attached to the column section 24.

When the second lever 90 is pivoted clockwise as viewed in Fig 7, the ramp member 106 is moved axially so as to urge the ball 109 downwardly in the tube 110 thereby pivoting the locking lever 114 downwardly against the spring 117 so as to disengage the teeth 118 and 120. The column section 24 can then be moved angularly upwardly or downwardly each side of mean axis indicated at Z in Fig 2. In Fig 2, the total upward angular movement  $u$  is  $2^\circ$  and the total angular downward movement  $d$  is  $6^\circ$ . Other suitable angles may be used. The section 24 is normally biased into its uppermost angular position by a pair of tension springs 121 extending between the yoke 22 and plates 123 on the section 24.

After the angular position has been selected, the return movement of the lever 90 permits re-engagement of the teeth 118, 120. The return movement is effected by the action of spring 46 on the brake applying member 34 and hence on the cable 50. As the first and second levers 74, 90 move back towards their initial positions as shown

in Fig 6, the ramp defining member 106 is urged via the spring 103 to a position where the ramp 108 clears the ball 109. The action of the leaf spring 117 then causes the finger 112 to urge the ball 109 upwardly to permit re-engagement of the teeth 118, 120. The projection 98 eventually clears the finger 96 of the lever 90 ensuring that the ramp defining member 106 can move into a position in which the ramp 108 will permit re-engagement of the teeth 118, 120, the projection 97 finally positively ensuring that the lever 90 moves fully into the latter position.

From Fig 1, it will be appreciated that the full-line position of the knob 80 is well spaced from the rim 13a of the steering wheel 13. In order for a user to adjust the steering column, the user grips the handle 80 with two fingers F1, F2 of one hand H, the fingers being placed in respective recesses 80a, 80b of the handle. The user then draws the handle 80 outwardly away from the steering axis X against the bias of spring 82 so that the handle occupies the fully extended position shown in broken lines in Fig 1. While holding the handle 80 in its extended position and whilst simultaneously holding the rim 13a of the steering wheel 13 with the same hand, the user draws the handle 80 towards the steering wheel with the two fingers F1, F2 so as to pivot the first and second levers 74, 90 about the pivot pin 72 until the



projection 95 contacts the stop surface 97. The pivotal movement of the levers 74, 90 relieve the brake shoes 28 and disengage the teeth 118, 120 thereby enabling the steering column to be adjusted for length and angular position.

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By using either the same hand H or with both hands on the steering wheel 13, the necessary adjustment can be made to the steering column and the handle 80 can then be released. On releasing the handle 80, the spring 82 returns the handle to its full-line position, the brake 28 is re-applied and the teeth 118, 120 re-engage to lock the steering column in its newly adjusted position. Once the handle 80 re-occupies its full-line position, lies well clear of the steering wheel rim 13a so that it cannot be accidentally manipulated by the user when the user is steering the vehicle.

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In an alternative embodiment of release device 26 as shown in Figs 8 and 9, a brake shoe 128 on a plate 141 is frictionally engageable with the sliding tube 16. The plate 141 is acted upon by an adjustable screw 129 on a brake lever 130. The brake lever 130 is pivotally connected at one end to a bracket 132 on the fixed tube 14. A brake applying member 134 has a shaft 136 pivoted on a bracket 138 mounted on the fixed tube 14. The brake applying member 134 is L-shaped and comprises a first

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arm 140 carrying a roller 142 and a second arm 144 which is resiliently connected to the bracket 132 by means of a tension spring 146. A shaft 136 is positioned adjacent the juncture of the two arms 140, 144 and the spring 146 normally urges the roller 142 downwardly against a lever 130. In that way, the lever 130 urges the brake shoe 128 against the sliding tube 16 so as normally to lock the tube 16 against axial movement relative to the fixed tube 14. The brake applying member 134 also includes a release arm 148 connected to the cable 50 and movement of the cable 50 to the right as viewed in Figs 8 and 9 causes the brake applying member 134 to be turned anti-clockwise against the bias of spring 146 so as to relieve the braking effect of the brake shoe 128 and permit the tube 16 to be moved axially relative to the fixed tube 14.

The control system 60 can take the form of a single lever which is used to release the steering column for one mode of adjustment only, eg steering wheel tilt.

The steering column described has a number of mountings M1, M2, M3 and M4 used when mounting the steering column in a vehicle. Also the upper column section 24 includes a tube 200 for supporting an ignition switch (not shown) and wiring associated therewith.

CLAIMS

1. An adjustable steering column for a vehicle, the steering column having a control means for releasing the steering column for adjustment and for locking the steering column after adjustment, the control means including a lever arrangement which includes a manually grippable member movable away from a steering axis of the steering column and from a pivot for the lever arrangement to a position adjacent a rim of a steering wheel on the steering column to enable a user to grip the manually grippable member and hold the rim simultaneously with the same hand and then, while holding the rim, use that hand to pivot the manually grippable member relative to the steering wheel to release the steering column for adjustment.
2. An adjustable steering column according to Claim 1 in which the manually grippable member is movable away from the steering axis and lever pivot against a bias whereby upon manual release of the manually grippable member, the manually grippable member returns under the influence of the bias.
3. An adjustable steering column according to claim 1 or 2 in which a cushioning element is provided to cushion the return of the manually grippable member under the influence of the bias.

4. An adjustable steering column according to Claim 1  
2 or 3 in which the control means is arranged to actuate  
a release means for enabling the steering column to be  
adjusted in length as a result of moving the said  
5 manually grippable member relative to the steering wheel.

5. An adjustable steering column according to Claim 4  
in which the steering column has first and second  
telescopic parts the first of which is movable relative  
10 to the second to enable the steering column to adjusted  
in length and the release means includes a brake which is  
normally arranged in an operative position to inhibit  
telescopic movement, the release means being operable by  
the control means to release the brake to permit length  
15 adjustment of the steering column.

6. An adjustable steering column according to Claim 5  
in which the brake is normally urged into its operative  
position by a brake lever of the release means which has  
20 a first arm arranged to move about a pivot so as to press  
the brake into its operative position and a second arm  
which is movable by operation of the control means to  
relieve the braking effect of the brake and permit length  
adjustment of the steering column.

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7. An adjustable steering column according to Claim 6  
in which the brake lever is normally urged by a spring

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about its pivot so as to press the brake normally into its operative position.

8. An adjustable steering column according to Claim 5,  
5 6 or 7 in which the brake applies braking to one of the first and second parts of the steering column such that attempted movement of said one member in a direction which reduces the length of the steering column causes the brake to provide a greater frictional resistance to  
10 such movement.

9. An adjustable steering column according to any preceding Claim in which the control means is arranged to actuate a release mechanism for enabling part of the  
15 steering column to be adjusted angularly as a result of moving the said manually grippable member relative to the steering wheel whereby the height or tilt of the steering wheel can be varied.

20 10. An adjustable steering column according to Claim 9 in which the movement of the manually grippable member relative to the steering wheel is arranged to enable the steering column to be adjusted in length and adjusted angularly at the same time.

25 11. An adjustable steering column according to any

preceding Claim in which a member is provided which prevents pivoting of the manually grippable member until the manually grippable member has been moved away from the lever pivot and steering axis.

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12. An adjustable steering column according to any preceding Claim in which the manually grippable member is pivoted towards the steering wheel to release the steering wheel for adjustment.

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13. An adjustable steering column according to any preceding Claim in which the manually grippable member forms part of a first lever of the lever arrangement, the lever arrangement including a second lever which is operated by pivotal movement of the first lever to release the steering column for adjustment.

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14. An adjustable steering column according to Claim 13 in which the first lever transmits pivotal movement to the second lever after the first lever has first travelled through a given distance.

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15. An adjustable steering column according to Claim 14 in which movement of the second lever is arranged to effect release of the steering column for angular movement.

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16. An adjustable steering column according to Claim 13, 14, or 15 in which the first and second levers are mounted on the pivot of the lever arrangement.

5 17. An adjustable steering column according to Claim 13, 14, 15 or 16 in which the first lever is connected to transmission means which operates to release the steering column for length adjustment as a result of pivotal movement of the first lever.

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18. An adjustable steering column according to Claim 17 in which the transmission means is a cable.

15 19. An adjustable steering column constructed and arranged substantially as described herein with reference to the accompanying drawings.